DOCUMENT RESUME

ED 325 072 IR 014 656

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TITLE	A Multi-Institutional Evaluation of Video-Based Distance Engineering Education.
SPONS AGENCY	American Society for Engineering Education, Washington, DC. Center for Professional Development.
PUB DATE	90
NOTE	7p.; Paper presented at the Frontiers in Education Conference (Vienna, Austria, July 2-4, 1990). For a related paper, see IR 014 655.
PUB TYPE	Speeches/Conference Papers (150)
EDRS PRICE	MF01/PC01 Plus Postage.
DESCRIPTORS	Age Differences; Comparative Analysis; *Distance Education; *Engineering Education; Graduate Students; Higher Education; Instructional Design; *Interactive Video; *Intermode Differences; *Learner Controlled Instruction; School Surveys; *Videotape Recordings

ABSTRACT

A survey of 50 academic institutions was designed to seek evidence of variation in student performance based on age, gender, graduate major, and instructional modality--i.e., traditional on-campus instruction, non-interactive videotape delivery, and interactive delivery systems complemented with real-time audio feedback. Responses were received from 8 of the institutions to whom requests for data were sent, resulting in a sample size of 8,431 graduate students. The sample was broken down into categories of on-campus degree-seeking students; on-campus non-degree students; off-campus degree-seeking students enrolled in courses delivered in a non-interactive (videotape) mode; off-campus non-degree students enrolled in non-interactive (videotape) courses; off-campus degree-seeking students enrolled in courses offered interactively; and off-campus non-degree students enrolled in interactively delivered courses. Data analyses show that: (1) these categories do affect student performance as it is measured by grades; (2) there are significant variations found among male students according to instructional category; (3) student age affects performance although gender does not; (4) as long as levels of student/faculty interaction are at a level sufficient to support quality instruction, non-interactive delivery formats are both useful and effective in balancing competing work and school demands; and (5) distance education students perform better when they control not only where but when learning occurs. (DB)

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A Multi-Institutional Evaluation of Video-Based Distance Engineering Education

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ASEE funded the current effort to seek evidence of variation in student performance (with grades used as an outcome measure) when observed against the following independent variables: age, gender, and instructional modality (traditional on-campus instruction, non-interactive videotape delivery, and interactive delivery systems complimented with real-time audio feedback).

SAMPLE SELECTION/DESCRIPTION

Letters soliciting institutional participation were sent to over 50 colleges of engineering. Eight responded positively. These include: Arizona State University (n=1,388), Auburn University (n=172), California State University, Chico (n=802), Colorado State University (n=245), Oklahoma State University (n=78), Purdue University (n=1,225), University of Arizona (n=555), and Washington State University (n=262). Data previously obtained from a 1981-1985 University of Massachusetts (n=3,704) survey was added to these responses.

The sample was divided into 6 categories: #0, traditional on-campus graduate students; #1, on-campus non-degree graduate students; #2, off-campus degree graduate students enrolled non-interactive (videotape) courses; #3, same as #2 but non-degree; #4, off-campus degree graduate students enrolled in interactively delivered courses; #5, same as #4 but non-degree.

RESEARCH DESIGN

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IR014252

The current effort collapsed grade responses into two categories. In this binary mode, grades of 3.0 and above were considered "success". Performance at less than the 3.0 level was considered "failure."

The success/failure criterion is based on the traditional acceptance that grades of 3.0 or better are considered indicia of success at the graduate level. Performance falling below the 3.0 level is considered unacceptable.

While all following comparisons will be based on this dichotomous approach, mean graduate performance will be displayed for purposes of illustration.

A full-factorial model could not be implemented given that institutional responses to the survey varied. In their place, main effect models were used to test for significant differences (at alpha=.01) among instructional methodologies, age, and gender cohorts. Contrasts comparing success/failure within cohorts were also constructed and tested for statistical significance.

FINDINGS

The following illustrate those statistically significant variations in performance found as a result interactions between the independent variables and instructional modalities.

Note the following:
* = significant at .01
** = significant at .001
*** = significant at .0001

Only those interactions with statistical significance will be listed.

Population Profile: Student Category

CATEGORY/SAMPLE SIZE/MEAN QPA	
0 On-Campus Degree	
3,759	3.30
1 On-Campus Non-Degree	
113	2.12
2 Off-Campus, Non-Interactive, Degree	
915	3.44
3 Off-Campus, Non-Interactive, Non-Degree	
1,084	2.96
4 Off-Campus, Interactive, Degree	
1,124	3.25
5 Off-Campus, Interactive, Non-Degree	
1,436	2.95

QUESTION #1: Does student category have a significant effect on success/failure in graduate engineering performance?

Analysis of Variance Table

Source	DF	CHI-SQUARE	PROBABILITY
Intercept	1	984.29	0.0001
Category	5	261.27	0.0001 ***

Yes. Significant to 0.0001

QUESTION #2: Are significant variations in success/failure in found between student categories?

Analysis of Contrasts

Contr'st	DF	CHI-SQUARE	PROBABILITY
0,2,4 vs. 1,3,5	1 (3.31 vs. 2.92)	176.35	0.0001***
1 vs. 3,5	1 (3.12 vs. 2.95)	11.23	0.0008**
0 vs. 2	1 (3.30 vs. 3.44)	15.12	0.0001***
2 vs. 4	1 (3.44 vs. 3.25)	16.04	0.0001 ***
1 vs. 3	1 (2.12 vs. 2.96)	13.41	0.0002 **
1 vs. 5	1 (2.12 vs. 2.95)	8.18	0.0042 *

QUESTION #3: Does gender have a significant effect on success/failure in graduate engineering performance?

Analysis of Variance Table

Source	DF	CHI-SQUARE	PROBABILITY
Intercept	1	328.88	0.0001
Gender	1	3.77	0.0523
StudCat	5	106.83	0.0001***

No

QUESTION #4: Are significant variations in success/failure among male engineering graduate students found between instructional categories?

Analysis of Contrasts: MALE

Contrasts	DF	CHI-SQUARE	PROBABILITY
0,2,4 vs. 1,3,5 (3.41 vs. 2.77	1	52.82	0.0001***
0 vs. 2, 4 (3.12 vs. 3.24)	1	6.65	0.0099*
1 vs. 3, 5 (2.06 vs. 2.80)	1	13.80	0.0002**
1 vs. 3 (2.06 vs. 2.98)	1	14.94	0.0001***
1 vs. 5 (2.06 vs. 2.78)	1	9.23	0.0024 *

QUESTION #5 Are significant variations in success/failure among female engineering graduate students found between instructional categories? **No**

QUESTION #6: Does student age have a significant effect on success/failure in graduate engineering performance?

Analysis of Variance Table

Source	DF	CHI-SQUARE	PROBABILITY
Intercept	1	655.25	0.0001
StuCat	5	243.08	0.0001
ChronAge	4	21.51	0.0003

Yes Significant at .001 level

QUESTION #7: Are significant variations in success/failure in graduate engineering performance found between student categories among 22-25 year olds

Analysis of Contrasts: 22-25 Years

Contrasts	DF	CHI-SQUARE	PROBABILITY
0,2,4 vs. 1,3,5 (3.33 vs. 2.92)	1	49.81	0.0001***
1 vs. 3,	1	9.15	0.0025*

5	(2.12 vs. 2.96)		
1 vs. 3	1	10.57	0.0011*
	(2.12 vs. 3.09)		
1 vs. 5	1	6.75	0.0094*
	(2.12 vs. 2.88		

QUESTION #8 Are significant variations in success/failure in graduate engineering performance found between student categories among 26-30 year olds.

Analysis of Contrasts: 26-30 Years

Contrasts	DF	CHI-SQUARE	PROBABILITY
0,2,4 vs. 1,3,5	1 (3.25 vs. 2.77)	48.25	0.0001***
0 vs. 2	1 (3.26 vs. 3.43	7.26	0.0071*
2 vs. 4	1 (3.43 vs. 3.09	16.02	0.0001***
3 vs. 5	1 (2.98 vs. 2.68)	7.69	0.0056*

QUESTION #9: Are significant variations in success/failure in graduate engineering performance found between student categories among 31-35 year olds?

Analysis of Contrasts: 31-35 Years

Contrasts	DF	CHI-SQUARE	PROBABILITY
0,2,4 vs. 1,3,5	1 (3.35 vs. 2.84)	42.05	0.0001***
0 vs. 2, 4	1 (3.21 vs. 3.46)	15.79	0.0001***
0 vs. 2	1 (3.21 vs. 3.64)	19.81	0.0001***
2 vs. 4	1 (3.64 vs. 3.27	15.29	0.0001***

QUESTION #10: Are significant variations in success/failure in graduate engineering performance found between student categories among 36-40 year olds? **No**

QUESTION #11: Are significant variations in success/failure in graduate engineering performance found between student categories among enrollees over 40? **No**

CONCLUSIONS

The data and their analyses support

The data and their analyses support the contention that off-campus graduate engineering students do not suffer from the inability to "talk back" to faculty in real time. Indeed the current research speaks to the contention that certain cohorts among distance students perform better when they control not only where but when learning occurs.

This seems especially true for men in the 26 to 30 and 31 to 35 year old cohorts who, during this stage of their personal lives and professional careers, are hard pressed to balance the myriad demands placed on their time. For this group, videotape's inherent flexibilitas seem not only desireable but significant in terms of success. For these videotape delivery offers "value added" benefits that candid-classroom's critics have long said are not provided in this instructional modality.

None of this is to suggest that faculty and students do not need to interact. However, data indicate that as long as levels of student/faculty interaction are at a tier both necessary and sufficient to support quality instruction, even though not carried out in real-time, non-interactive delivery formats are both useful and effective in balancing competing work and school demands.

THE AUTHOR

Dr. Harvey Stone currently serves as Special Assistant to the President and Assistant Professor of Education at the University of Delaware.